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I claim:

1. A vertical high-voltage transistor comprising:
a substrate of a first conductivity type;
a pair of first trenches in the substrate that define a mesa;
a field plate disposed in each first trench of the pair of first
trenches, the field plate being separated from the mesa
by a dielectric layer;
a second trench in the dielectric layer;
an insulated gate disposed in the second trench between the
mesa and the field plate member.
2. The vertical high-voltage transistor according to claim 1
wherein a drift region of the first conductivity type extends in
the mesa in a vertical direction.
3. The vertical high-voltage transistor according to claim 2
further comprising:
a body region of a second conductivity type adjoining the
drift region in the mesa.
4. The vertical high-voltage transistor according to claim 1
wherein a width of the mesa is less than a height of the mesa.
5. A vertical high-voltage transistor comprising:
first and second trenches that define a mesa having first and
second sidewalls in a semiconductor substrate, the first
and second trenches being filled with a dielectric material
that covers the first and second sidewalls;
first and second field plates disposed in the dielectric material
of the first and second trenches, respectively, the first
and second field plates being respectively insulated from
the first and second sidewalls of the mesa in a lateral
direction, and insulated from the semiconductor substrate
in a vertical direction, by the dielectric material;
first and second gate members disposed in the dielectric
material between the first and second sidewalls of the
mesa, and the first and second field plates, respectively.
6. The vertical high-voltage transistor according to claim 5
wherein the first and second field plates extend from a top
surface of the semiconductor substrate.
7. A vertical high-voltage transistor comprising:
first and second trenches that define a mesa having first and
second sidewalls in a semiconductor substrate, the mesa
having a height and a width, the height being greater than
the width, the first and second trenches being filled with
a dielectric material that covers the first and second
sidewalls;
first and second field plates disposed in the dielectric material
of the first and second trenches, respectively, the first
and second field plates extending from a top surface of
the semiconductor substrate to a vertical depth that is
substantially the same as the height of the mesa, each of
the first and second field plates being respectively insulated
from the first and second sidewalls of the mesa in a
lateral direction, and insulated from the semiconductor
substrate in a vertical direction, by the dielectric material;
a trench gate structure that includes first and second gate
members disposed in the dielectric material between the
first and second sidewalls of the mesa, and the first and
second field plates, respectively.
8. A vertical high-voltage transistor comprising:
first and second trenches that define a mesa having first and
second sidewalls in a semiconductor substrate, the mesa
having a height and a width, the height being at least five

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- times greater than the width, the first and second
trenches being filled with a dielectric material that covers
the first and second sidewalls;
first and second field plates disposed in the dielectric material
of the first and second trenches, respectively, the first
and second field plates extending from a top surface of
the semiconductor substrate to a vertical depth that is
substantially the same as the height of the mesa, each of
the first and second field plates being respectively insulated
from the first and second sidewalls of the mesa in a
lateral direction, and insulated from the semiconductor
substrate in a vertical direction, by the dielectric material;
- a trench gate structure that includes first and second gate
members disposed in the dielectric material between the
first and second sidewalls of the mesa, and the first and
second field plates, respectively.
9. A vertical high-voltage transistor comprising:
a mesa of semiconductor material having first and second
sidewalls
a dielectric material that covers the first and second sidewalls;
first and second field plates disposed substantially parallel
to the first and second sidewalls, respectively, the first
and second field plates being respectively insulated from
the first and second sidewalls of the mesa in a lateral
direction, and insulated from the semiconductor substrate
in a vertical direction, by the dielectric material;
first and second gate members disposed in the dielectric
material between the first and second sidewalls of the
mesa, and the first and second field plates, respectively.
10. A vertical high-voltage transistor comprising:
first and second trenches that define a mesa having first and
second sidewalls in a semiconductor substrate, the mesa
having a height and a width, the height being at least five
times greater than the width, the first and second sidewalls
being covered with a dielectric material having a lateral
thickness of at least two microns;
first and second field plates disposed in the first and second
trenches, respectively, the first and second field plates
extending from a top surface of the semiconductor substrate
to a vertical depth that is substantially the same as the
height of the mesa, each of the first and second field
plates being respectively insulated from the first and
second sidewalls of the mesa by the dielectric material,
the first and second field plates also being insulated from
the substrate;
a trench gate structure that includes first and second gate
members disposed in the dielectric material between the
first and second sidewalls of the mesa and the first and
second field plates, respectively.
11. The vertical high-voltage transistor according to claim
10 wherein a drift region of a first conductivity type extends in
the mesa in a vertical direction.
12. The vertical high-voltage transistor according to claim
11 further comprising:
a body region of a second conductivity type adjoining the
drift region in the mesa, the body region being disposed
adjacent the first and second gate members.

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